



# THE MAGIC OF COAL

A PUFFIN  
PICTURE BOOK

BY PEGGY M. HART





## FIVE TO SEVEN—AND THE WHEELS GO ROUND!

“FIVE to seven, Mr. Hewitt; there goes the train. And the wheels at the pit are going round.”

“Aye, its always the same. And if the wheels at the pit didn’t go round, the five to seven wouldn’t run either.”

“Why not, Mr. Hewitt?”

“Because the men going down the pit are getting coal, and that steam engine couldn’t run if they had no coal for the fires, could it?”

“Of course not. You used to work down the pit, didn’t you Mr. Hewitt? What’s it like, working over there?”

“Ah, better now than when I started; they made it quite a bit easier with all this machinery they’re using, though it’s still a man’s job.”

“I bet it is. Tell me what it’s like, Mr. Hewitt.”









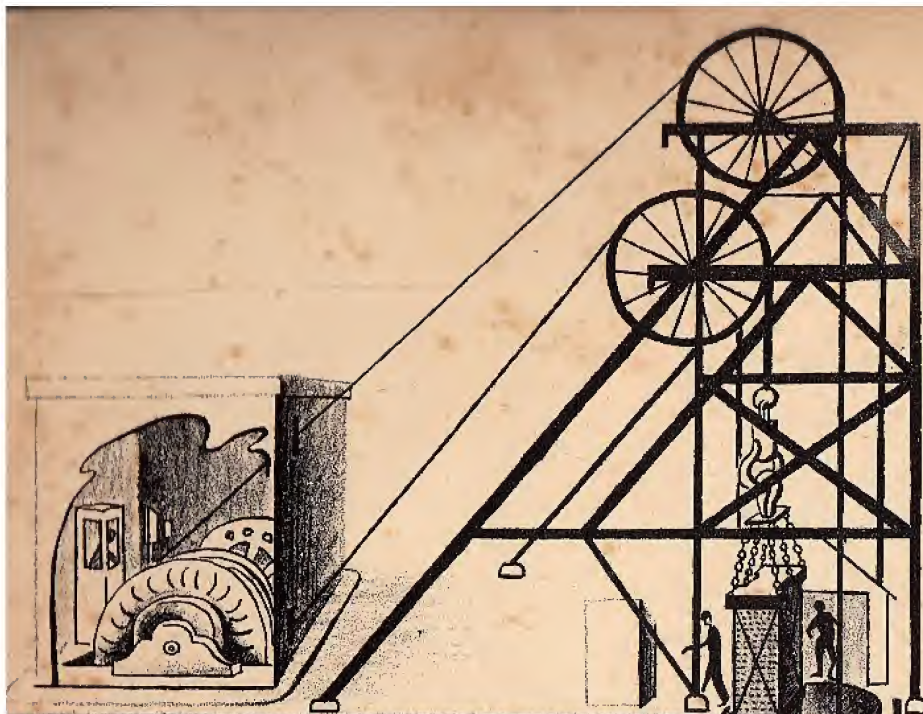
## WHEN THE NIGHT SHIFT GOES ON

It is at about five to seven that the men can be seen trekking up the hill to the pit. In the old days a stranger could have guessed where they were going, because they wore their dirty working clothes and their helmets, as well as carrying tins containing a snack to eat on the job. Now that most pits have pithead baths it may be difficult to tell the miner going to work from his neighbour going to the pictures.

After clocking in and changing into his pit clothes the miner gets a lamp from the charging room and goes to the cage. The cage is a lift, usually double decker, which carries the men down through the earth. It also carries the coal up to the surface. The men crowd into both decks, the gates are clanged to, the signal given, and down they go. No one may take matches, or anything inflammable, down a mine, and before a stranger is allowed into the cage he has to "declare" his matches as if he were at a Customs house, and leave them at the top of the shaft. A match lighted in the presence of an inflammable gas might cause a serious explosion.

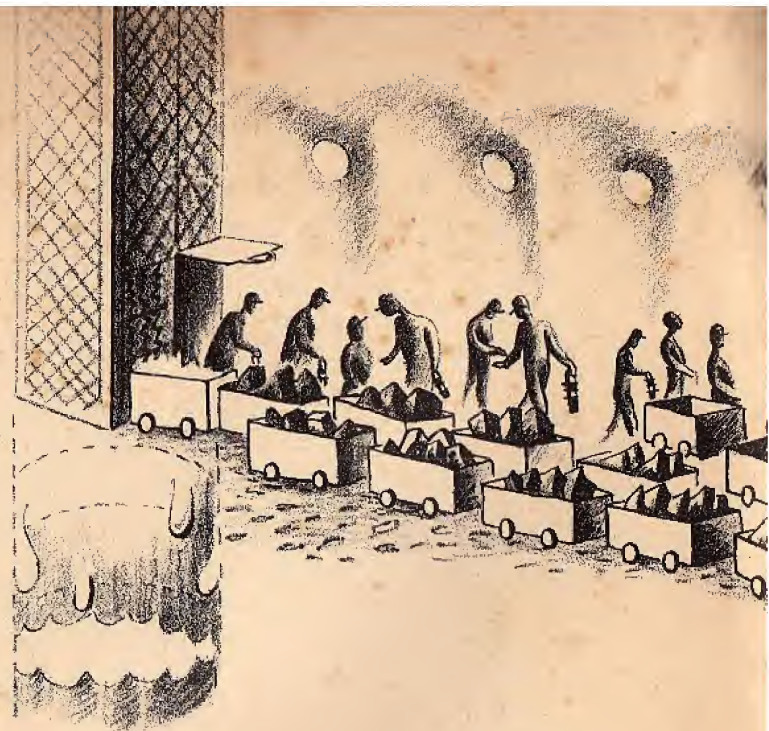






## THE WINDING ENGINE

As one cage goes down, another comes up. You could make a model of what happens if you fixed two weights at either end of a long string—they would be your cages on the steel cable; then if you wound the middle of the string round a cotton reel and turned the reel round, one weight would go up and the other down; your cotton reel would be acting just like the winding engine, which is a very big wheel partly sunk



into the floor, and rotated by electricity. The pulley wheels raise the cables immediately above the shaft. There is a man in charge, but if anything happened to him and the cages went too fast they would be automatically stopped. A small device containing two lights which travel up and down as the cages travel up and down tells him exactly whereabouts in the shaft the cages are, and how fast they are travelling. He never puts the winding engine into motion without telephoning the man at the top of the shaft, as he is too far away to be able to see for himself if everyone is safely in and the gates shut.



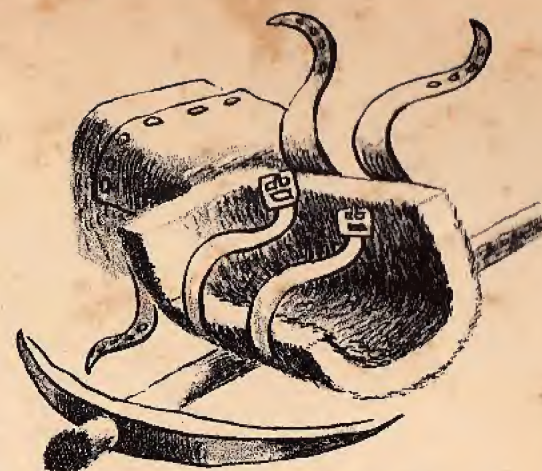
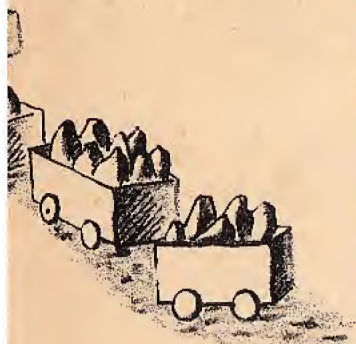
The cage stops and the men get out, but that's not the bottom of the shaft. It goes down into the sump, where water collects and is pumped out at intervals. Water seeping through the earth into the mine is a great enemy, and has continually to be pumped out.

When the miner leaves the cage, he may have to walk a long way before he gets to the coal; his lamp lights the way. He may either hold it in his hand or wear it on the front of his helmet; some lamps are attached to their own batteries.

Davy's safety lamp was a wonderful invention for the miners. The

flame was covered by a very fine gauze which prevented it from igniting the explosive methane in coal gas; it also acted as a warning, because the flame grew big and yellow in the presence of methane.

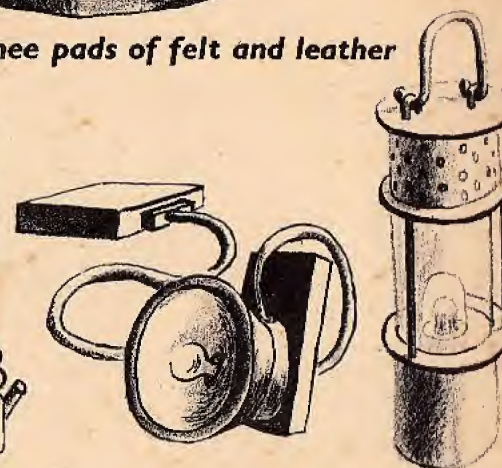
As well as his lamp, every miner has a helmet, made of compressed board; this prevents him from hurting his head when he has to go along very low passages. If he has to kneel down on his job he carries his knee pads, to put on when he arrives at the coal face. There is a right and a left knee pad, just like a pair of shoes.



*Pick, and knee pads of felt and leather*



*Davy's safety lamp,  
1815*

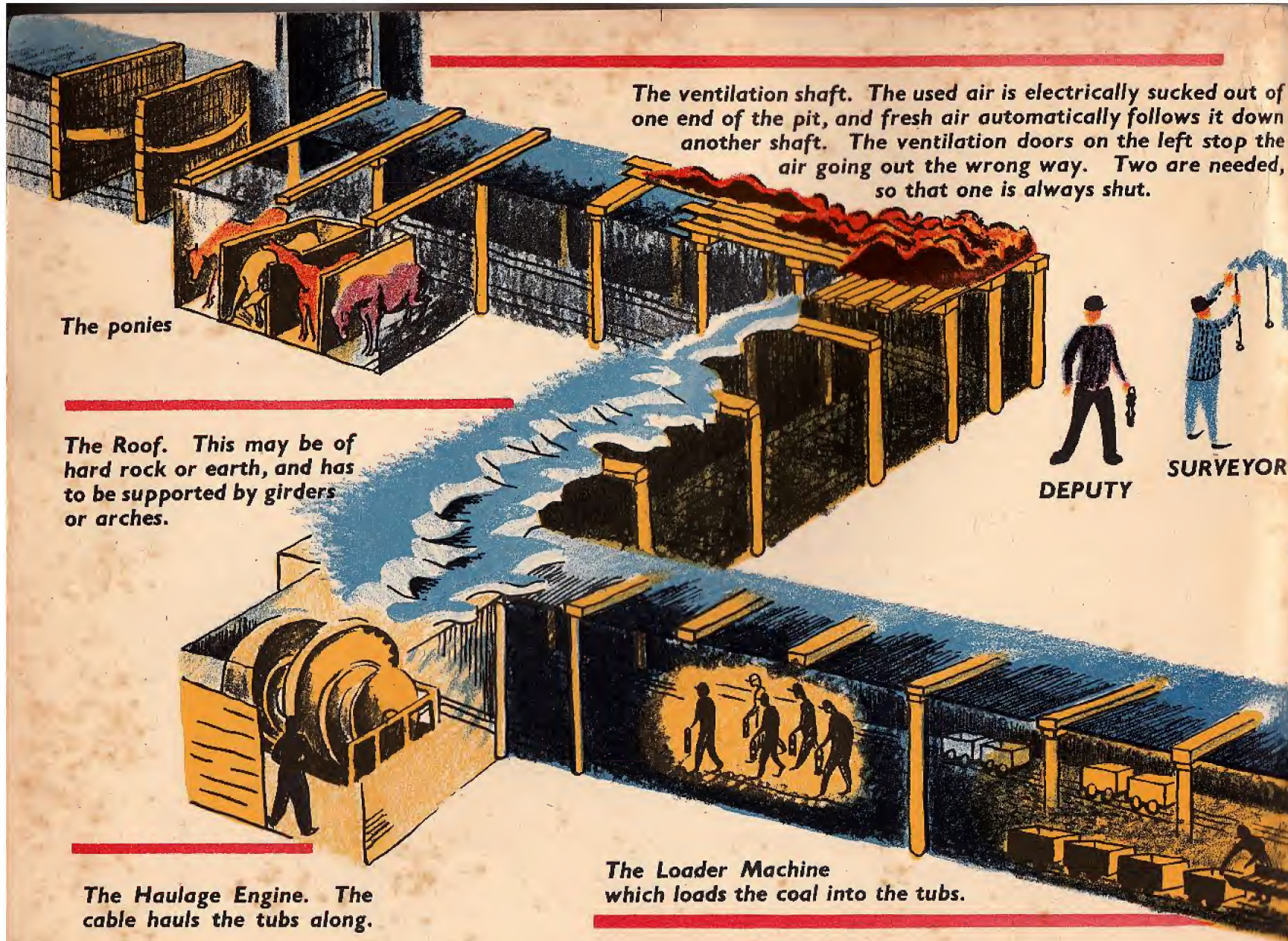


*Modern lamps*



*Helmet made of compressed cardboard*





The ponies

The Roof. This may be of hard rock or earth, and has to be supported by girders or arches.

The Haulage Engine. The cable hauls the tubs along.

The Loader Machine which loads the coal into the tubs.

The "Rippers", who lengthen the road to the coal and strengthen it every day.





**ONSETTER**



**HAULAGEMAN**



**LOADER**



**RIPPER**



**PACKER**



**BELTMAN**



**SHOTFIRER**



**BORER**



**CUTTERS**



**COAL FACE MAN**

## UNDERGROUND

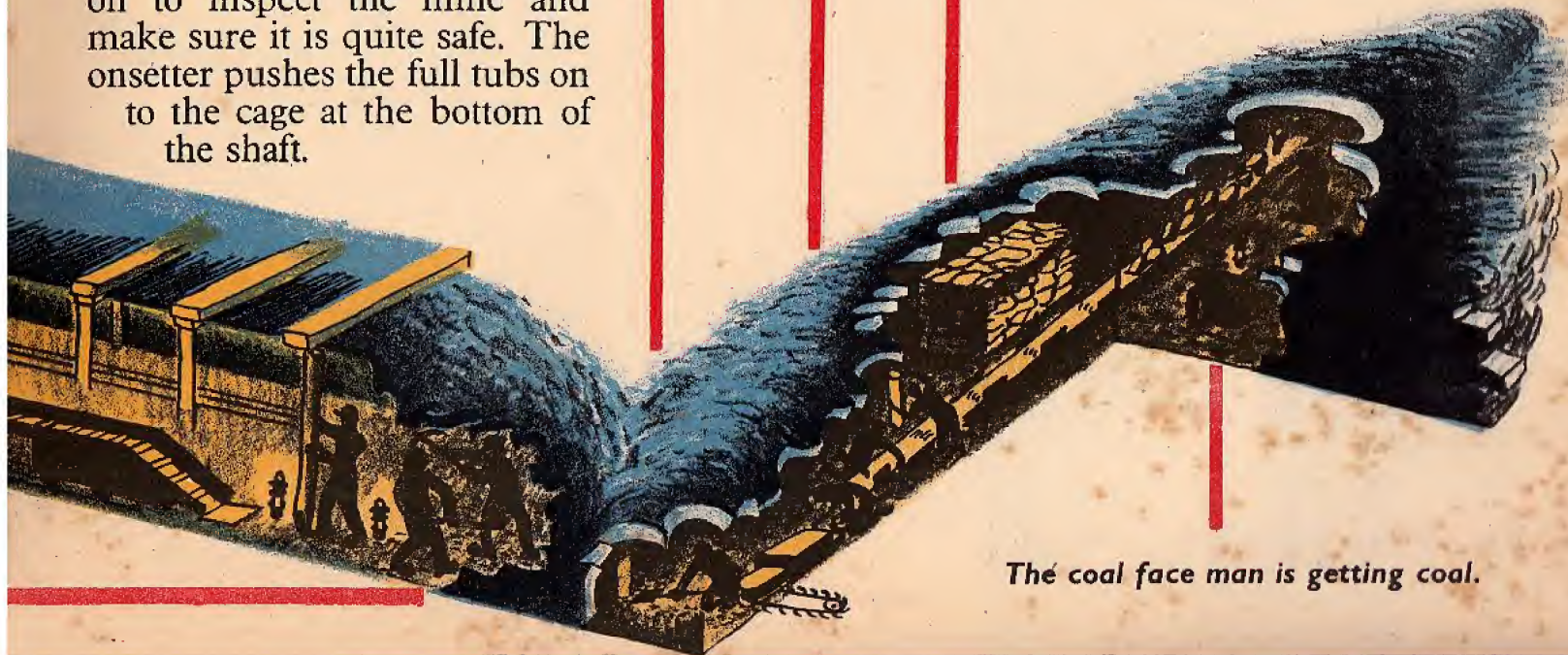
Here is a diagram of what happens underground showing all the men who work there. One of the deputy's jobs is to go down before the men come on to inspect the mine and make sure it is quite safe. The onsetter pushes the full tubs on to the cage at the bottom of the shaft.

The cutters undercutting the coal, to help loosen it.

The belt men setting up the conveyor belt.

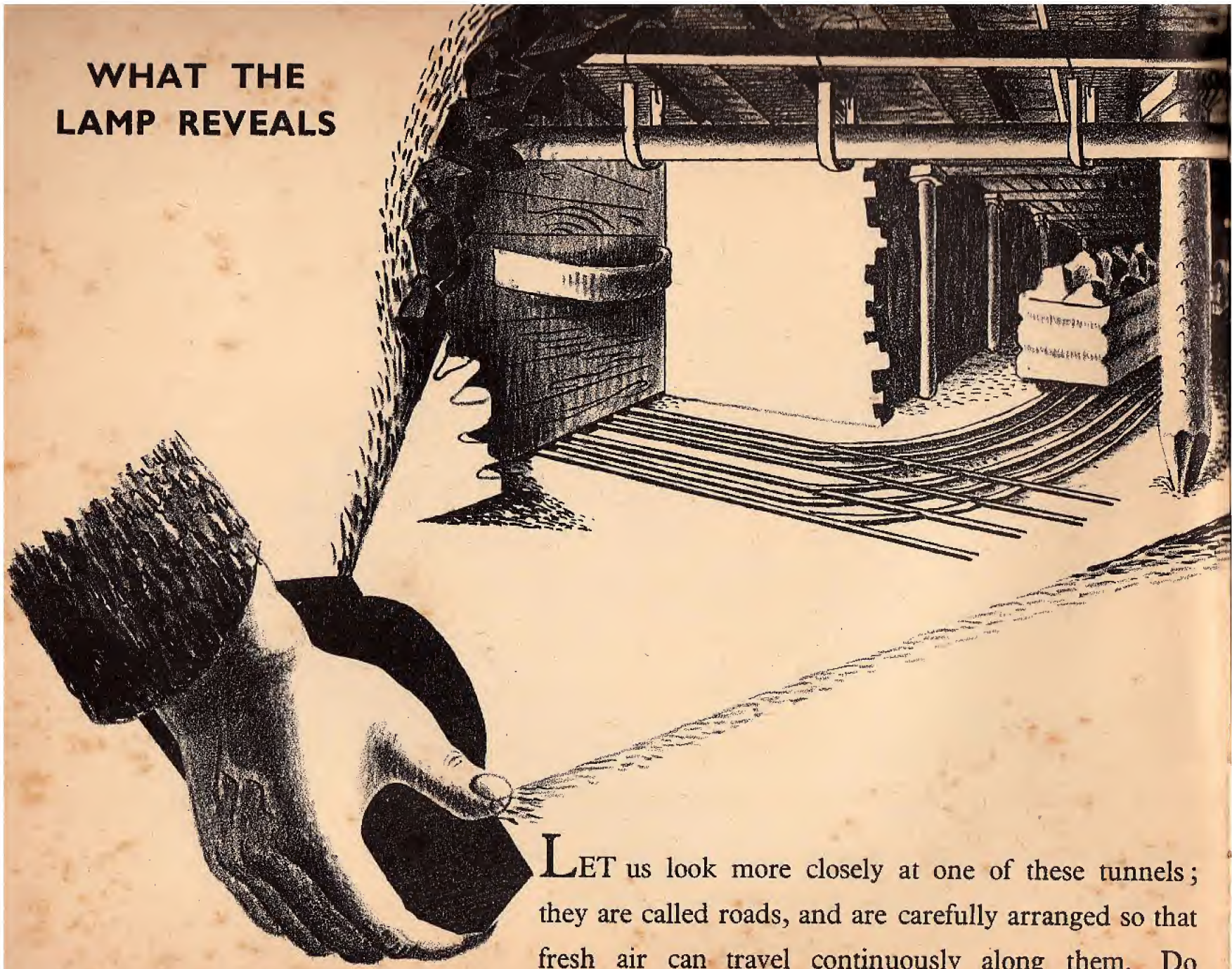
The packers at work.

The coal face man is getting coal.



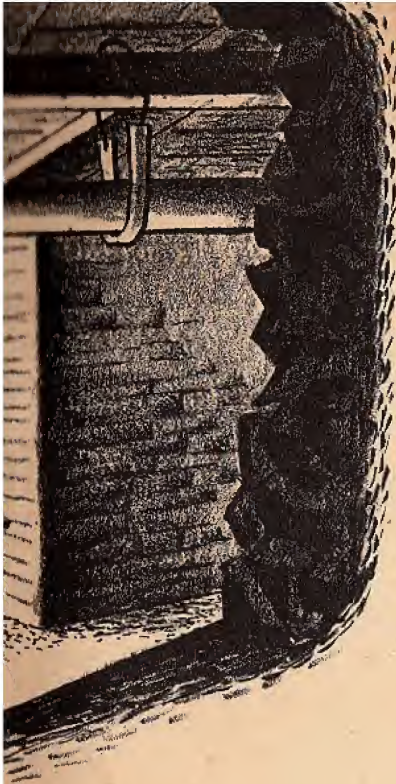


## WHAT THE LAMP REVEALS



LET us look more closely at one of these tunnels; they are called roads, and are carefully arranged so that fresh air can travel continuously along them. Do





you see the heavy ventilation door? As you pass through this door and the next one you can feel the mighty rush of wind which is being directed along the roads by these two doors. This rush of wind is even stronger at the bottom of the ventilation shaft where the used air is being drawn out of the mine.

For most of the way the roads are cut out of the rock, strengthened at intervals with pine or metal props, and left like that, unless the roof is soft and has to be supported by rafters. These rafters and supports are continually being renewed, as the great weight of earth above them bears them down so that the rafters sag in the middle. Near the shaft the walls are bricked up and the road is electrically lit.

You can see the electric cable hanging by wire and leather from the girders. It takes power to the many different machines which are used in getting coal.

Empty and full tubs always keep to their own sides on the track, which is made by the blacksmith above ground. He marks the junctions out on a concrete slab and fits the parts together on that.

In between the rails runs the haulage line, a steel cable which hauls the tubs along the rails.

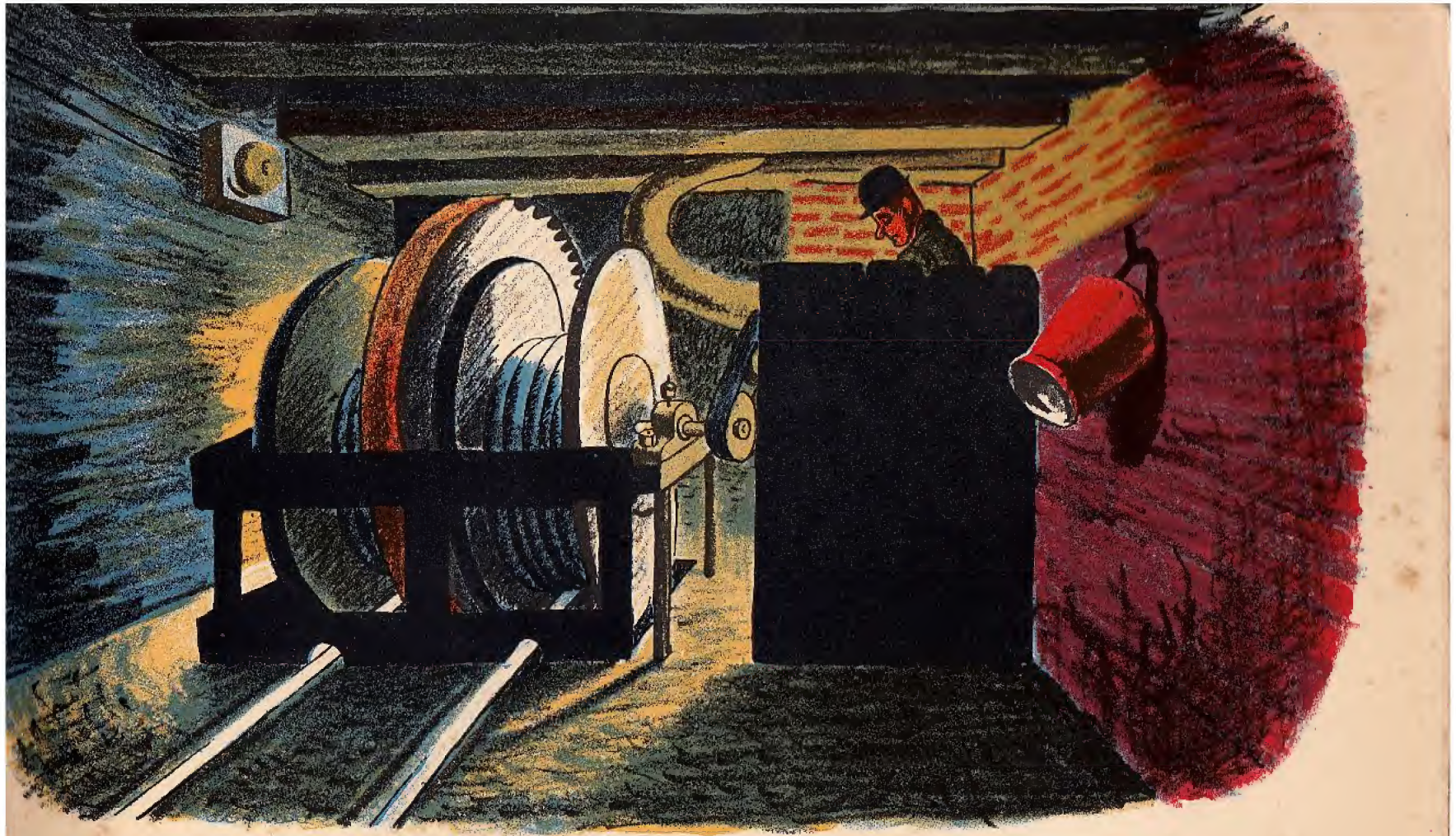




## THE HAULAGE MACHINE

**T**HE haulage line is drawn along by the haulage machine, which does most of the heavy hauling underground. There are several other ways of hauling tubs along. One is by a hand-worked wheel and cable, used for short distances. Where machinery cannot be used, ponies haul the tubs. These ponies are very small, and have an extremely simple form of harness, so that instead of turning them round on the rails, the pony and harness complete can be moved round to the other end of the tub if it is wished to go in the opposite direction! The ponies have their rest days and their holidays just like the men do, only they stay in the mine during their rest days and only go up above ground for their holidays. Naturally they don't get so much fun out of life as other ponies do, but they get every care which can be given them and are sent into the country to rest as soon as they are too old to work.

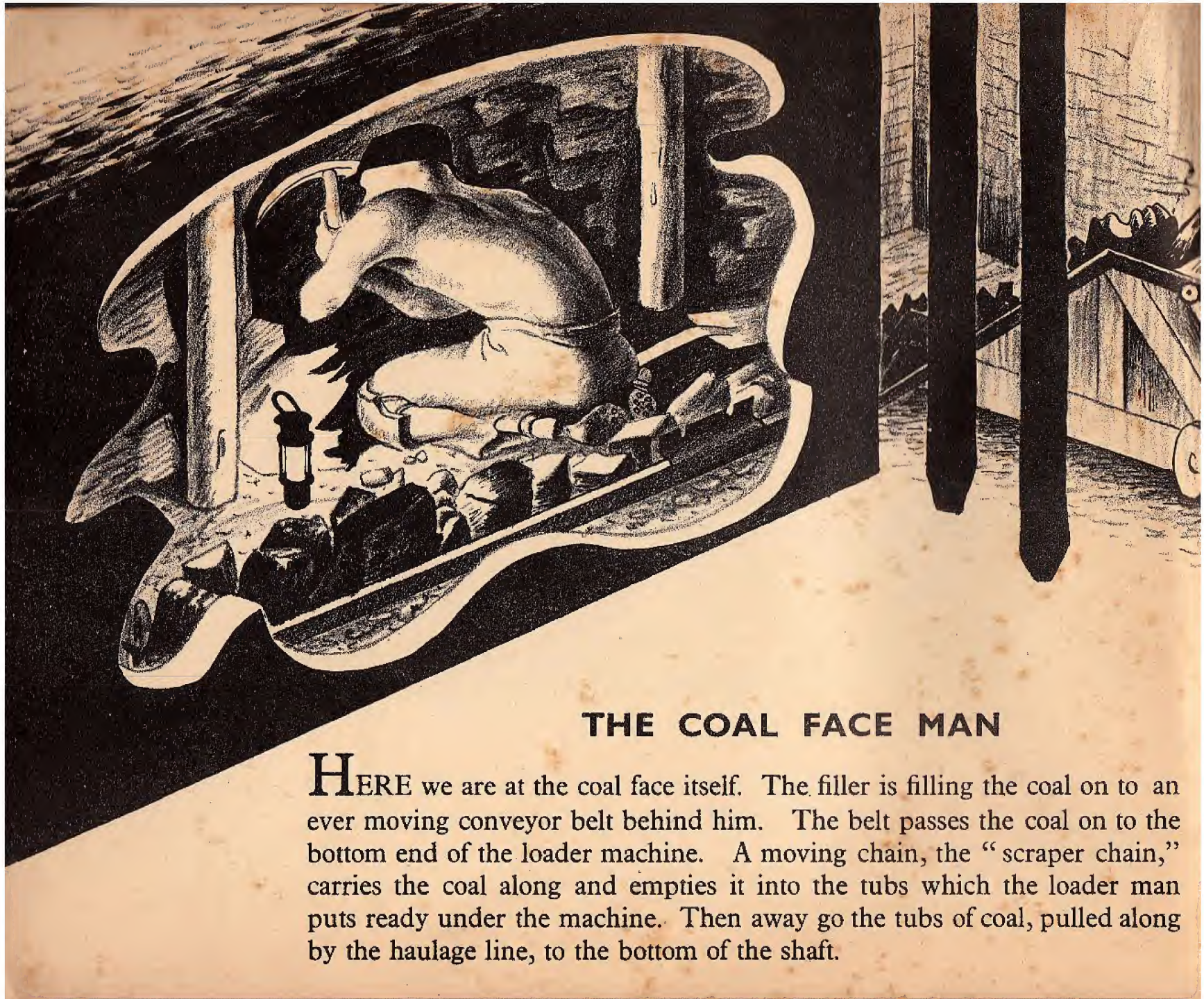




Not so many are used underground now that there are so many other ways of moving the tubs. Men called onsetters push the full tubs on to the cage at the shaft bottom. And in some pits diesel engines pull the tubs.

Full tubs coming down on a man in the darkness could be fatal, so a bell is rung before tubs pass; it is worked by crossing two wires overhead.





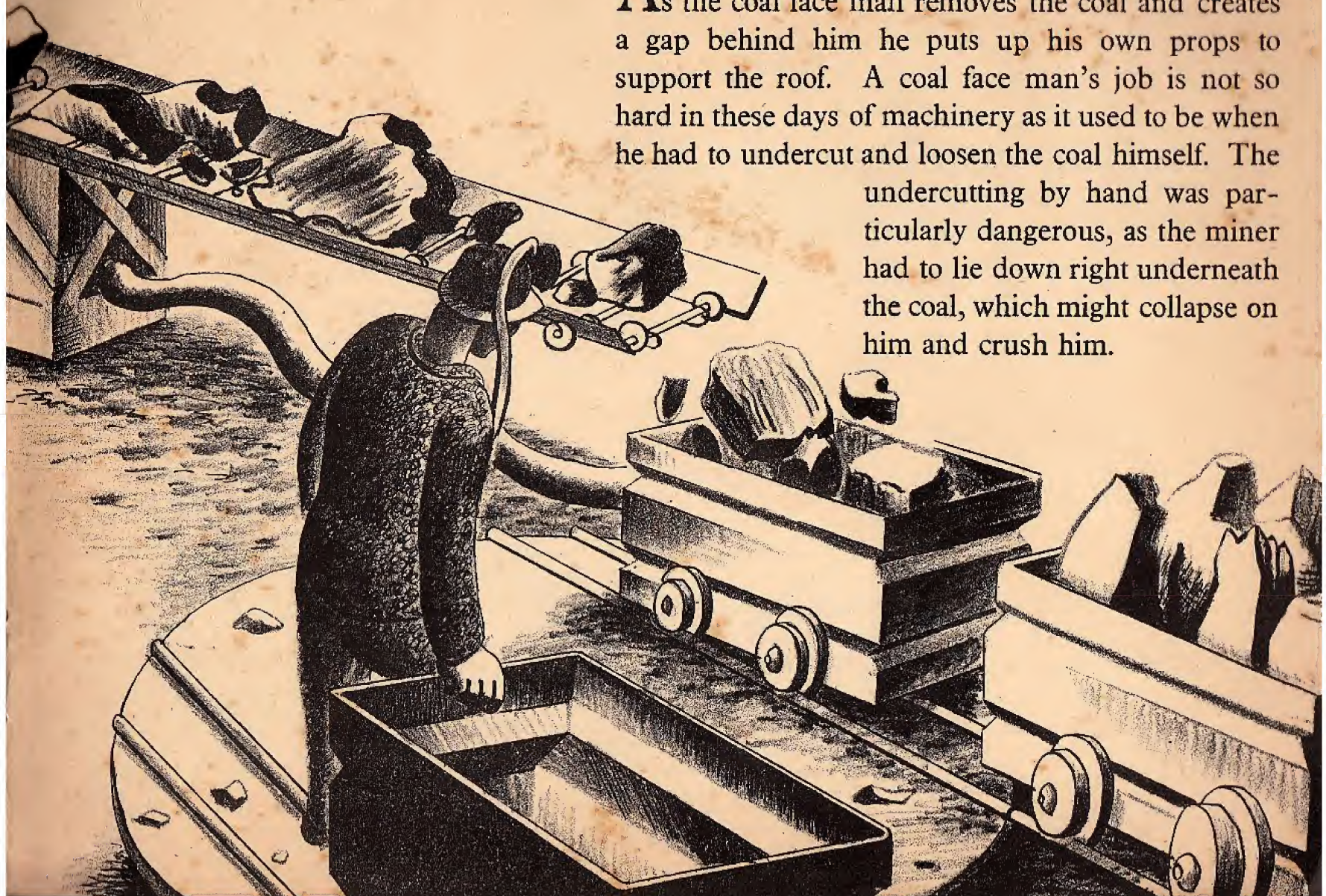
## THE COAL FACE MAN

**H**ERE we are at the coal face itself. The filler is filling the coal on to an ever moving conveyor belt behind him. The belt passes the coal on to the bottom end of the loader machine. A moving chain, the "scraper chain," carries the coal along and empties it into the tubs which the loader man puts ready under the machine. Then away go the tubs of coal, pulled along by the haulage line, to the bottom of the shaft.



## THE LOADER MACHINE

As the coal face man removes the coal and creates a gap behind him he puts up his own props to support the roof. A coal face man's job is not so hard in these days of machinery as it used to be when he had to undercut and loosen the coal himself. The undercutting by hand was particularly dangerous, as the miner had to lie down right underneath the coal, which might collapse on him and crush him.







## PREPARING THE WAY FOR THE COAL FACE MAN

**B**EFORE the coal face man starts work, another shift of men prepares the coal for him. The cutters take their machine along the coal face, cutting a ledge five feet deep under the coal with the sharp little picks on the moving chain of their electric machine. One man works the machine while the other shovels away the coal dust which is formed during the cutting, and which piles up against the machine and would quickly stop it working if it were left there. This man has a very hard job, as he has to shovel very quickly indeed to keep up with the machine. Even this coal dust is not wasted, but is compressed into briquettes.





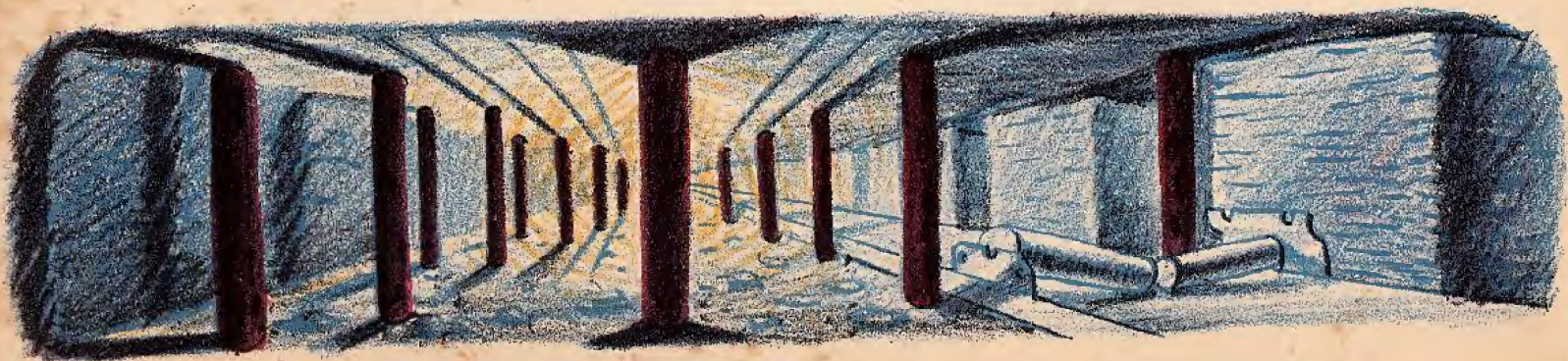


Next the coal is loosened. The driller drills a hole a yard deep into the coal. After him comes the shotfirer who puts the explosive and detonator into the hole, and packs it in with sand and clay, leaving the wires hanging out. These wires are attached to a shot firing cable, and the cable is attached to a battery. Several tests for gas are made during this operation, and if all is safe the shots are fired and the coal is loosened.

This is where the coal face man on the previous page starts his work, filling the

loosened coal on to the conveyor belt. When he has finished he has left a great space behind him, and the belt is a long way from the coal.

The next shift comes on. They move the conveyor belt up to the coal. They pack all the waste stone into the space which the filler, or coal face man, left behind him. And they pull away all the props he put in as he removed the coal. These three shifts fill the twenty-four hours, and every job must be finished before the next one can commence; it is very difficult to do this if there is a fault in the seam, which presents unusual problems and extra hard work for the men.







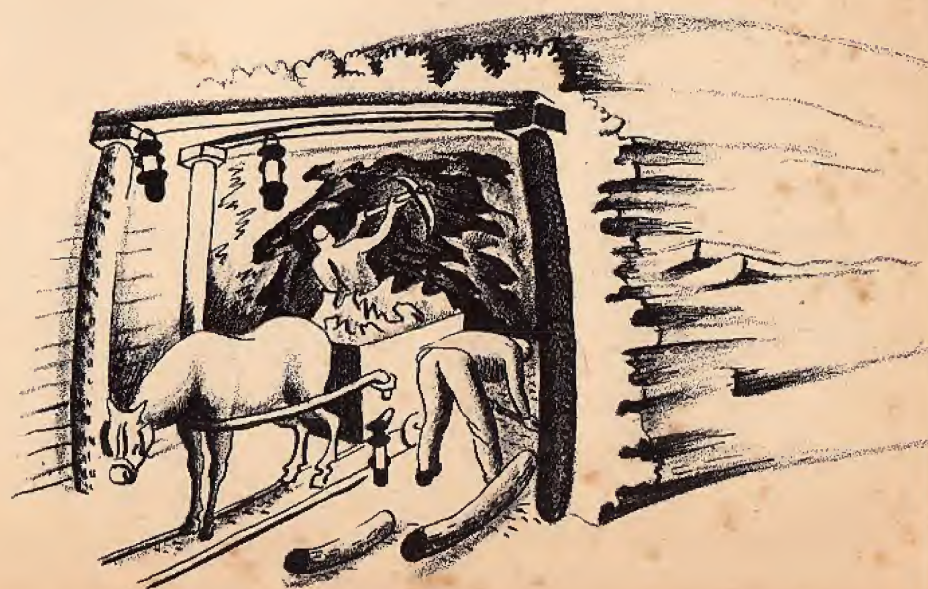
## FINDING NEW SEAMS

**I** DARESAY you know how coal was formed in the first place, through the decaying of pre-historic plants during countless years and at different periods, so that there are often different layers of coal separated by other rocks and earth. Sometimes these layers were displaced by terrific upheavals in the earth, so that the coal seams are not always straight or even continuous.

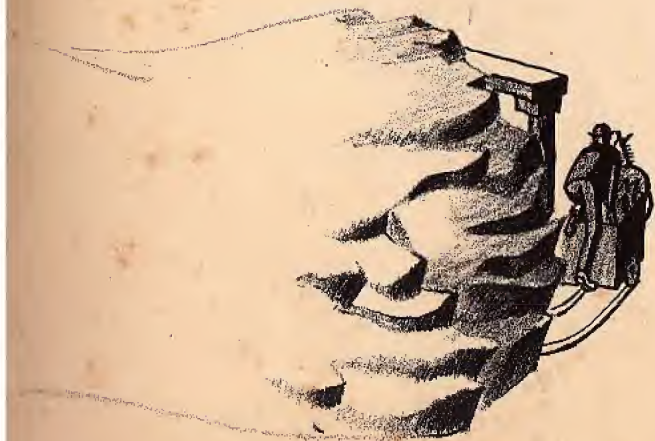
These upheavals sent the coal jutting up out of the ground, so that there was coal lying about waiting to be picked up. This is what people did, and sometimes they followed the

seam into the ground a little way; in mountainous districts it is still possible to reach the coal by a horizontal tunnel. Coal is usually found nowadays by boring holes into the ground and examining the earth which is brought up. If there is coal in it, vertical shafts are sunk and a new mine started. There are always two shafts to a pit, so that if one fails the miners are not trapped.

Another way of getting at the coal, if you know the seam is near the surface, is just to clear away the earth above it and dig it out. This is called "outcropping."

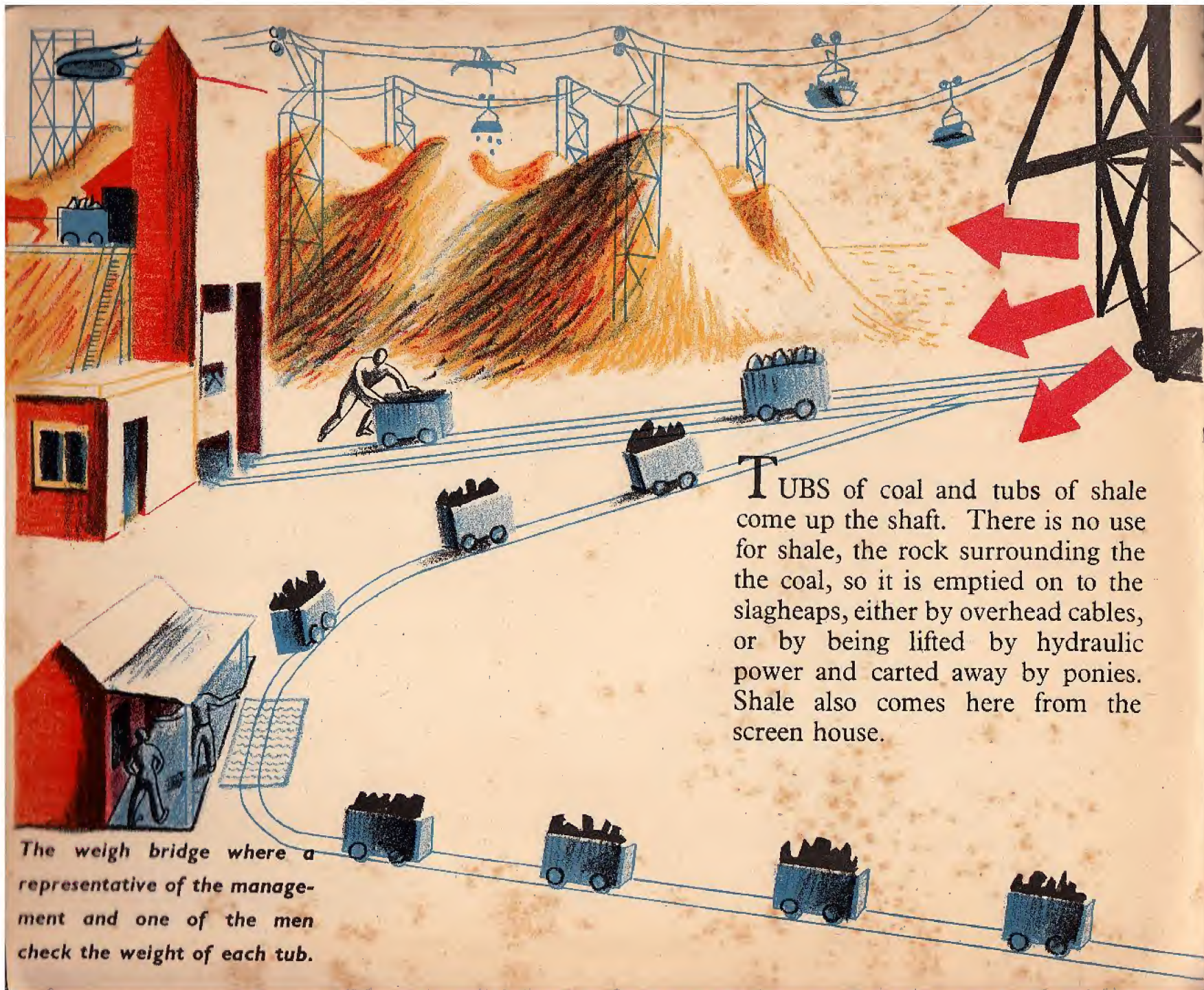






When new seams have been found or two roads have to be joined, the surveyor comes down with his plans and instruments and gives the "rippers," who have to make the new road, their direction. He does this by hanging two weighted lines from the roof; if the rippers keep the end of their tunnel in line with these two they are going in the right direction.



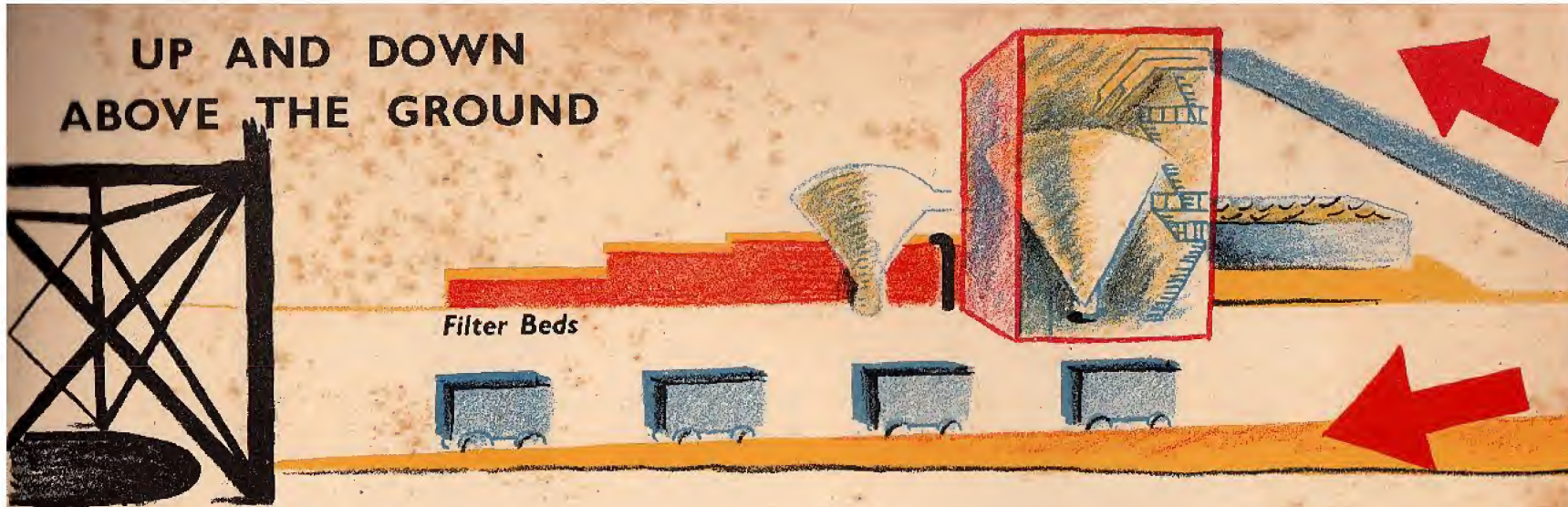


TUBS of coal and tubs of shale come up the shaft. There is no use for shale, the rock surrounding the the coal, so it is emptied on to the slagheaps, either by overhead cables, or by being lifted by hydraulic power and carted away by ponies. Shale also comes here from the screen house.

The weigh bridge where a representative of the management and one of the men check the weight of each tub.



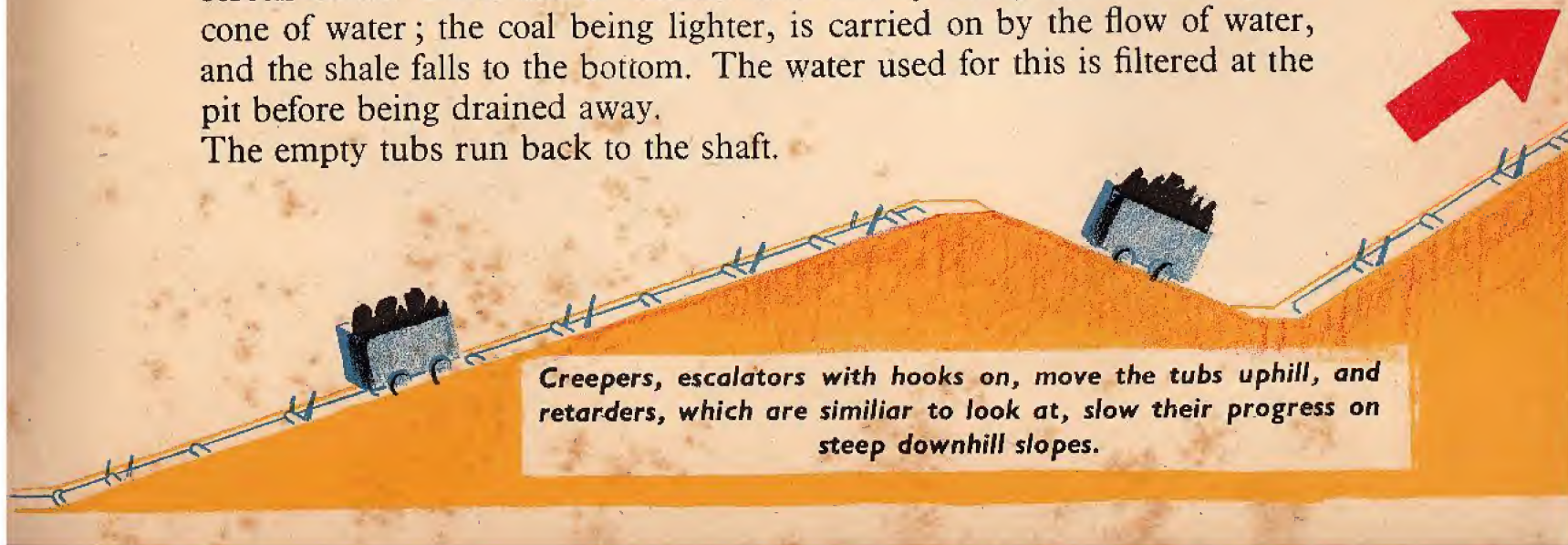
## UP AND DOWN ABOVE THE GROUND



There is no haulage line above ground. The rails are laid so that the tubs either run gently downhill or are carried uphill by "creepers," which are like escalators.

First each tub is weighed. Then it travels to the tipplers and thence to the screen house. Some coal is washed after this by being agitated in a great cone of water; the coal being lighter, is carried on by the flow of water, and the shale falls to the bottom. The water used for this is filtered at the pit before being drained away.

The empty tubs run back to the shaft.



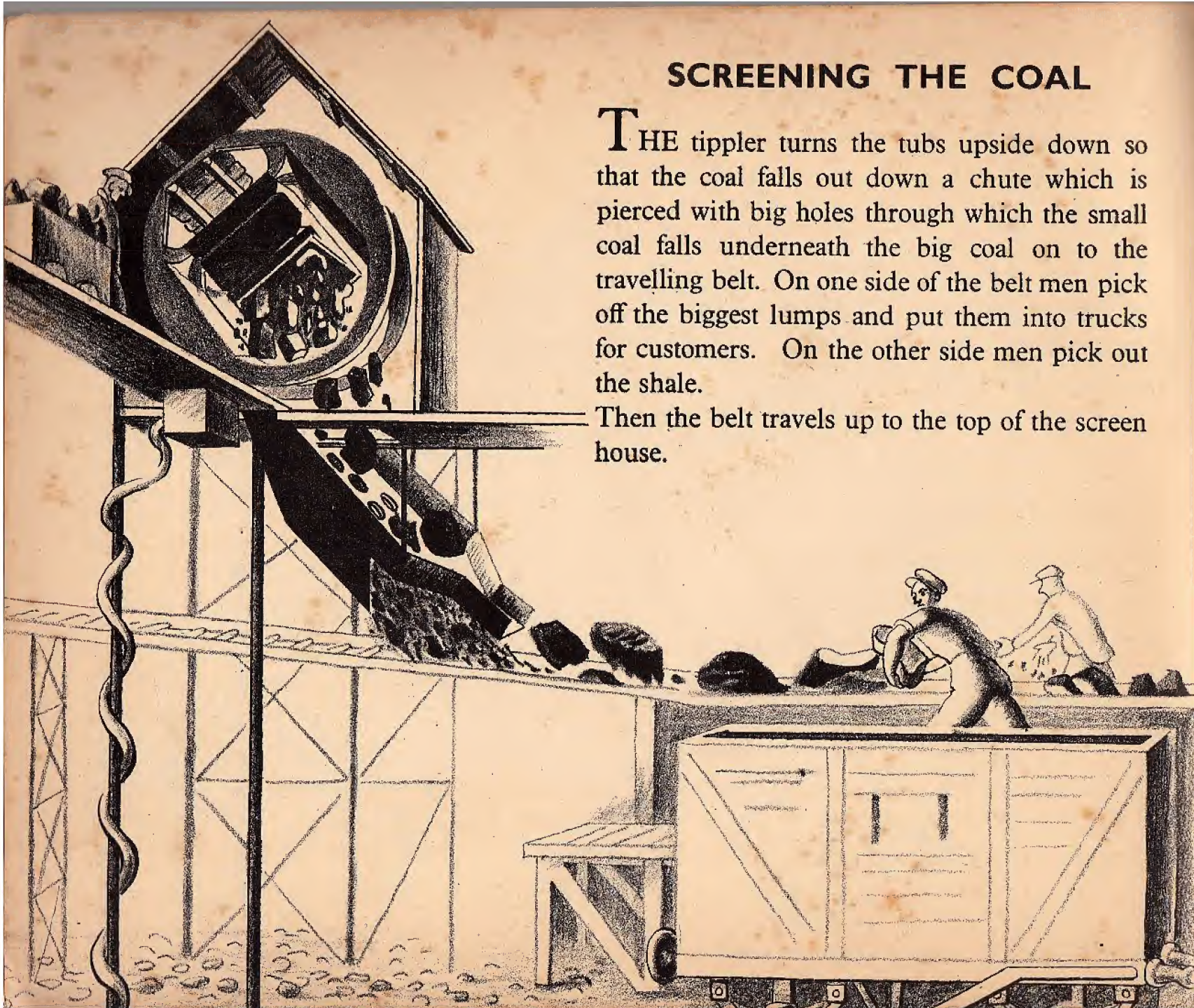
*Creepers, escalators with hooks on, move the tubs uphill, and retarders, which are similiar to look at, slow their progress on steep downhill slopes.*



## SCREENING THE COAL

THE tippler turns the tubs upside down so that the coal falls out down a chute which is pierced with big holes through which the small coal falls underneath the big coal on to the travelling belt. On one side of the belt men pick off the biggest lumps and put them into trucks for customers. On the other side men pick out the shale.

Then the belt travels up to the top of the screen house.

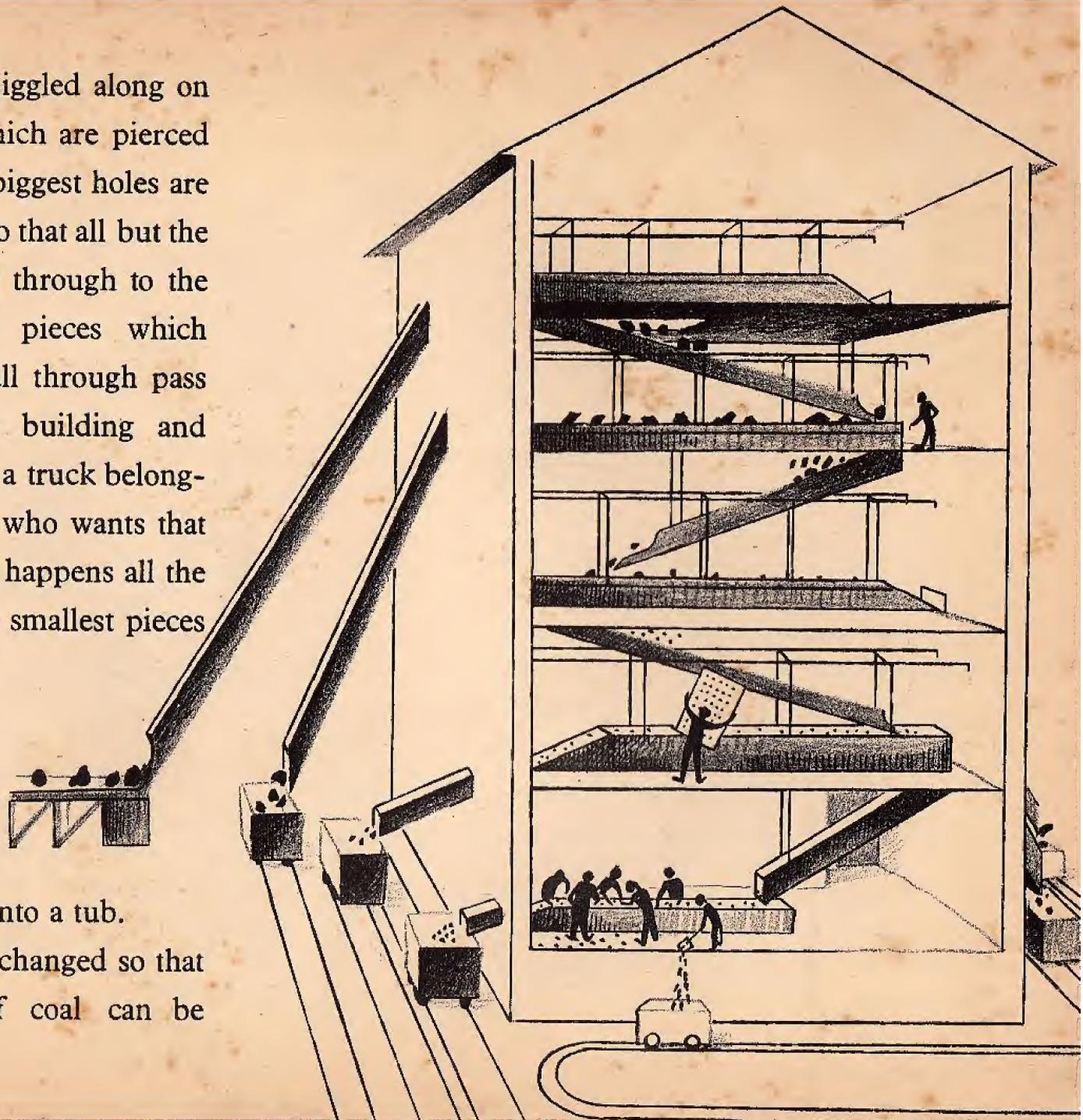




Here the coal is jiggled along on shaking plates which are pierced with holes. The biggest holes are in the top plates, so that all but the biggest pieces fall through to the next floor. The pieces which were too big to fall through pass right out of the building and down a chute into a truck belonging to a customer who wants that size of coal. This happens all the way down, till the smallest pieces reach the bottom.

Here boys straight from school pick out the shale and shovel it out into a tub.

The plates can be changed so that different sizes of coal can be screened.







## BETTER NOW THAN THEN

AND what of the miner when he has finished his job? In the old days he went home black and dirty, and bathed at home,

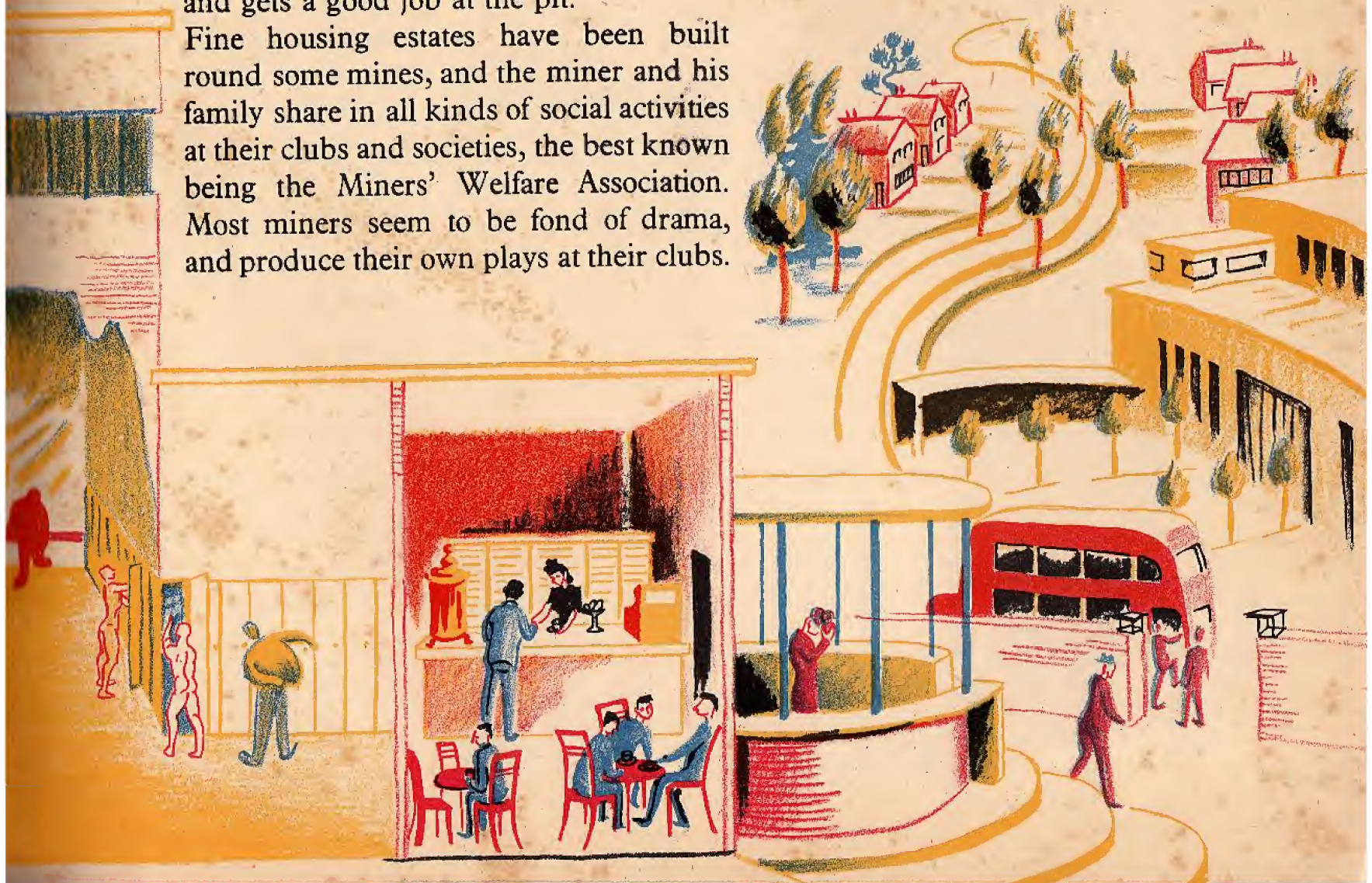
probably in a tub before the fire. Now he can go to the pit head baths, store his dirty clothes in a locker, have a shower, and put on his clean clothes which he keeps in another locker. If he likes he can have a snack at the canteen before he leaves. There is a spotlessly clean first-aid room at the pit head, with a first-aid man in charge, to deal with minor injuries. If a man is so badly injured that he cannot be moved the doctor, often a woman, goes down at once and attends to him in the mine. Doctors in mining districts say that their bravest patients are miners.



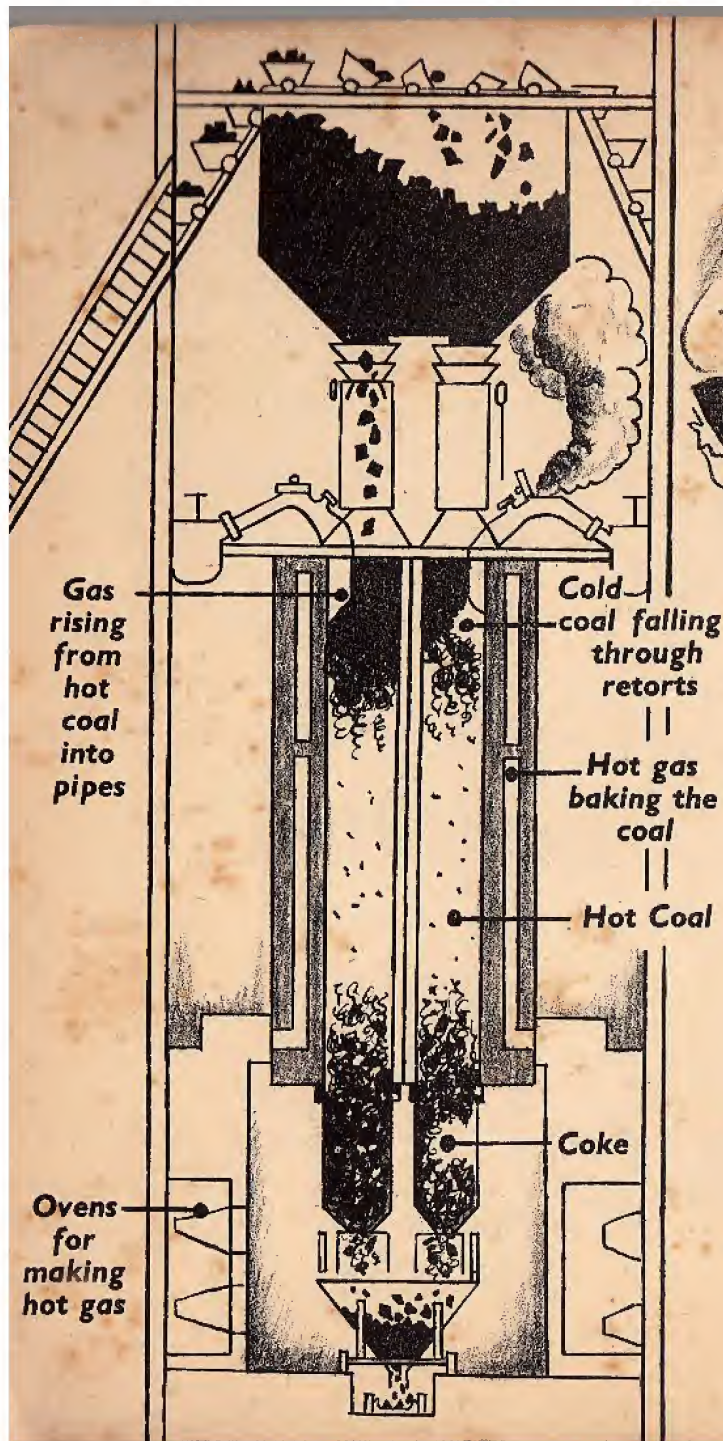


At most pits now a boy is examined as soon as he starts work, and if he proves promising he is given the chance to study at evening classes or at a university, and gets a good job at the pit.

Fine housing estates have been built round some mines, and the miner and his family share in all kinds of social activities at their clubs and societies, the best known being the Miners' Welfare Association. Most miners seem to be fond of drama, and produce their own plays at their clubs.







## THE GAS WORKS

**H**AVE you ever made charcoal? You fill a tin tightly with twigs, put on the lid firmly and punch a hole in it. Then you put the tin in the fire. Soon you will see a long, thin blue

flame shooting out of the hole. This is the gas being forced out of the twigs by the heat and catching fire; the twigs themselves are left as charcoal.

The same kind of thing happens at a gas works. COAL is put into brick retorts and heated from the outside, but instead of allowing the resulting gas to catch fire it is collected in big pipes. As it comes straight from the coal it is thick and yellow and dirty looking. This is because it contains such things as tar, ammonia and sulphur. By passing the gas through water and treating it in different ways these things are removed until only pure gas is left.

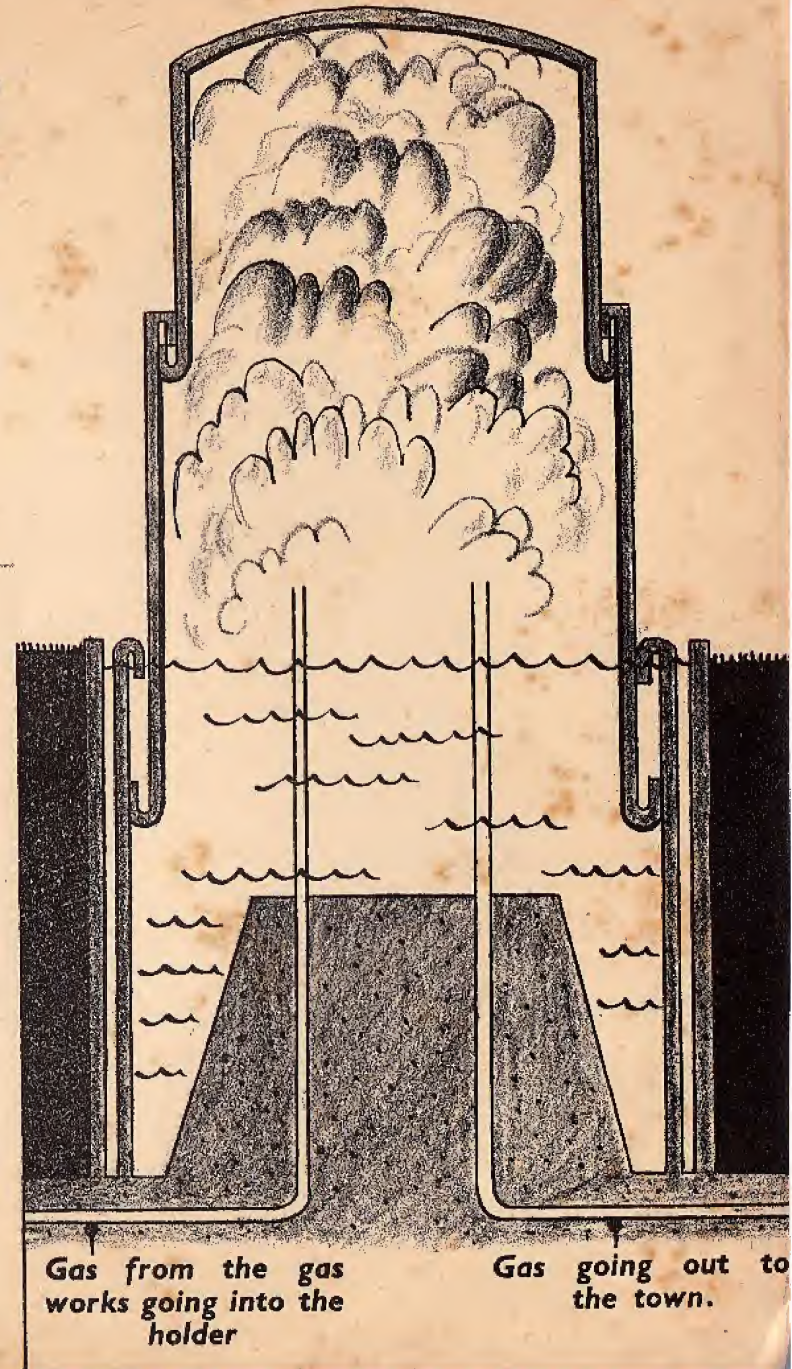




*Try keeping a cardboard carton up in the water by blowing into it. Your breath is another kind of gas.*

This is measured and regulated, and stored in the gas holder. The gas holder is like a huge cup floating upside down in a bowl of water. If no gas is blown up into the cup, it sinks down. If a lot of gas is blown up into it, it rises up. To prevent it blowing right out of the water it has a turned up rim on its lower edge which hooks on to a turned down rim below the water level.

One pipe carries the gas into the holder from the gas works, and another carries it from the holder to the houses in the town.









## WHEN THE LIGHTS GO UP

PRACTICALLY all our electricity is generated from coal. It is made at the power stations, and carried to all parts of the country by cables.

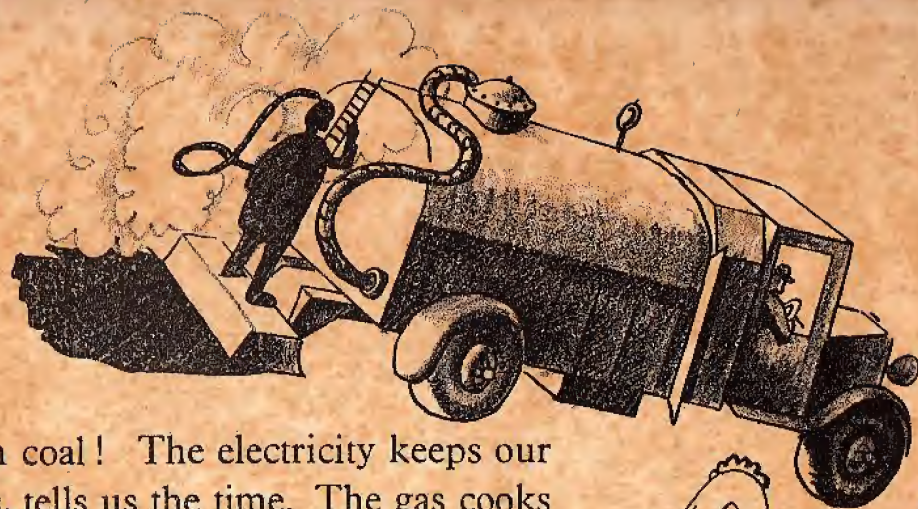
At night in the towns electric lights make the buildings as gay as a party — in peace time!











**W**HAT a lot of things come from coal! The electricity keeps our food cool and fresh, irons our clothes, tells us the time. The gas cooks our dinner. Anthracite or coke, which is what is left of the coal after it has given off its gas, heats our water.

The tar and ammonia and other things which are washed out of the gas before it goes to the oven make no end of things. Plastics, like the telephone receiver, dyes for our clothes, fertilisers to grow food, saccharines and aspirins, these are only a few of the treasures which the miner digs from the earth—not forgetting, of course, the coal itself which heats our rooms!

